LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Fundamentals of Chemistry – II (CHEM-H-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Kinetic Theory and Gaseous state:** Concept of pressure and temperature from kinetic theory of gas. Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case	Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011	4	Chalk and Talk	**(AS)**
	Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Wall collision and rate of effusion Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases		4	Chalk and Talk	**(AS)**
	Real gas and Virial equation: Deviation of gases from ideal behavior; Compressibility factor; Boyle temperature; Andrew's and Amagat's plots; van der Waals equation and its features; its derivation and application in explaining real gas behavior ; Existence of critical state, Critical constants in terms of van der Waals constants.	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	**(AS)**
	Law of corresponding states; Virial equation of state; van der Waals equation expressed in the Virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones potential - elementary idea.		3	Chalk and Talk	**(AS)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Fundamentals of Chemistry – II (CHEM-H-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II	**Chemical Bonding – I:** **i) Ionic bond:** General characteristics, types of ions, size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Lande equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elementary idea). Solubility energetics of dissolution process. **ii) Covalent bond:** Polarizing power and polarizabilty, ionic potential, Fajan's rules, Lewis structures, formal charge, Valence Bond Theory, The hydrogen molecule (Heitler – London approach), directional character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rules, dipole moments, VSEPR theory, shapes of molecules and ions containing lone pairs (examples from main group chemistry) and multiple bonding (σ and π bond approach).	i) Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). ii) Lee, J. D. Concise Inorganic Chemistry,5th Ed., Wiley India Pvt. Ltd., 2008	5	Chalk and Talk	**(SG)**
			5	Chalk and Talk	**(SB)**
	Theoretical principles of inorganic qualitative analysis: Basic principles involved in analysis of cations and anions and solubility products, common ion effect. Principle involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.	Svehla & Sivasankar , Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson, 2012.	5	Chalk and Talk	**(SG)**
Module : III	**Stereochemistry – II:**	**Nasipuri, D.**	4	Chalk and Talk	**(PR)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Fundamentals of Chemistry – II (CHEM-H-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Chirotopicityand its relationship with stereogenicity; concept of pseudoasymmetry for ABA type systems. Relative and absolute configuration: *R/S* descriptors; *erythro/threo* and *meso* nomenclature of compounds; *E/Z* descriptors for C=C, combination of *R/S*- and *E/Z* isomerisms.	**Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020**			
	Optical activity of chiral compounds: optical rotation, and specific rotation; racemic compounds, racemisation (through cationic, anionic intermediates); resolution of acids and bases *via* diastereomeric salt formation; optical purity and enantiomeric excess.	**Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002**	4	Chalk and Talk	**(PR)**
	General Treatment of Reaction Mechanism -I: **Reactive intermediates:** Carbocations (carbenium and carbonium ions), non-classical carbocations, carbanions, carbon radicals: generation and stability, structure and electrophilic / nucleophilic behaviour of reactive intermediates (elementary idea). **Reaction thermodynamics:** Free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change *via* BDE, intermolecular & intramolecular reactions.	**Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.**	4	Chalk and Talk	**(PR)**
	Reaction kinetics: Rate constant and free energy of activation; free energy profiles for one-step, and two-step reactions; catalyzed	**Sykes, P. A guidebook to**	3	Chalk and Talk	**(PR)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Fundamentals of Chemistry – II (CHEM-H-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	reactions, principle of microscopic reversibility; Hammonds postulate. **Substitution Reaction:** Free-radical substitution reaction: halogenation of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammonds postulate.	**Mechanism in Organic Chemistry, Pearson Education, 2003.**			
		Total	**45**		
Practical	**Qualitative semimicro analysis of mixtures containing three radicals. Emphasis should be given to the understanding of the chemistry of different reactions (only water /acid soluble salts):** **Cation Radicals** Na^+, K^+, Ca^{2+}, Sr^{2+}, Ba^{2+}, Al^{3+}, Cr^{3+}, Fe^{3+}, Mn^{2+}/Mn^{4+}, Co^{2+}/Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, NH_4^+, Sn^{2+}/Sn^{4+} **Anion Radicals** F^-, Cl^- , Br^-, I^-, $S_2O_3^{2-}$, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{3-}, BO_3^{3-},CrO_4^{2-} / $Cr_2O_7^{2-}$, SCN^-, $[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$, AsO_4^{3-},BrO_3^-, IO_3^-	Svehla & Sivasankar , Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson, 2012.	28	Chalk and Talk and Hand on Demonstration	**(SG)**
	Practice		2		
		Total	**30**		

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-2) & Chemistry MDC- II (CHEM-MD-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Kinetic Theory and Gaseous state:** Concept of pressure and temperature from kinetic theory of gas. Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case	Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011	4	Chalk and Talk	**(IS)**
	Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Wall collision and rate of effusion Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases		4	Chalk and Talk	**(IS)**
	Real gas and Virial equation: Deviation of gases from ideal behavior; Compressibility factor; Boyle temperature; Andrew's and Amagat's plots; van der Waals equation and its features; its derivation and application in explaining real gas behavior ; Existence of critical state, Critical constants in terms of van der Waals constants.	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	**(IS)**
	Law of corresponding states; Virial equation of state; van der Waals equation expressed in the Virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones potential - elementary idea.		3	Chalk and Talk	**(IS)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-2) & Chemistry MDC- II (CHEM-MD-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II	**Chemical Bonding – I:** **i) Ionic bond:** General characteristics, types of ions, size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Lande equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elementary idea). Solubility energetics of dissolution process. **ii) Covalent bond:** Polarizing power and polarizabilty, ionic potential, Fajan's rules, Lewis structures, formal charge, Valence Bond Theory, The hydrogen molecule (Heitler – London approach), directional character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rules, dipole moments, VSEPR theory, shapes of molecules and ions containing lone pairs (examples from main group chemistry) and multiple bonding (σ and π bond approach).	i) Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). ii) Lee, J. D. Concise Inorganic Chemistry,5th Ed., Wiley India Pvt. Ltd., 2008	5	Chalk and Talk	**(SG)**
			5	Chalk and Talk	**(SG)**
	Theoretical principles of inorganic qualitative analysis: Basic principles involved in analysis of cations and anions and solubility products, common ion effect. Principle involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.	Svehla & Sivasankar , Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson, 2012.	5	Chalk and Talk	**(SG)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-2) & Chemistry MDC- II (CHEM-MD-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III	**Stereochemistry – II:** Chirotopicityand its relationship with stereogenicity; concept of pseudoasymmetry for ABA type systems. Relative and absolute configuration: *R/S* descriptors; *erythro/threo* and *meso* nomenclature of compounds; *E/Z* descriptors for C=C, combination of *R/S*- and *E/Z* isomerisms.	**Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020**	4	Chalk and Talk	**(PR)**
	Optical activity of chiral compounds: optical rotation, and specific rotation; racemic compounds, racemisation (through cationic, anionic intermediates); resolution of acids and bases *via* diastereomeric salt formation; optical purity and enantiomeric excess.	**Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002**	4	Chalk and Talk	**(PR)**
	General Treatment of Reaction Mechanism -I: **Reactive intermediates:** Carbocations (carbenium and carbonium ions), non-classical carbocations, carbanions, carbon radicals: generation and stability, structure and electrophilic / nucleophilic behaviour of reactive intermediates (elementary idea). **Reaction thermodynamics:** Free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change *via* BDE, intermolecular & intramolecular reactions.	**Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.**	4	Chalk and Talk	**(PR)**
	Reaction kinetics: Rate constant and free energy of activation; free	**Sykes, P. A**	3	Chalk and Talk	**(PR)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-2) & Chemistry MDC- II (CHEM-MD-CC2-2)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	energy profiles for one-step, and two-step reactions; catalyzed reactions, principle of microscopic reversibility; Hammonds postulate. **Substitution Reaction:** Free-radical substitution reaction: halogenation of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammonds postulate.	**guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.**			
		Total	**45**		
Practical	**Qualitative semimicro analysis of mixtures containing three radicals. Emphasis should be given to the understanding of the chemistry of different reactions (only water /acid soluble salts):** **Cation Radicals** Na^+, K^+, Ca^{2+}, Sr^{2+}, Ba^{2+}, Al^{3+}, Cr^{3+}, Fe^{3+}, Mn^{2+}/Mn^{4+}, Co^{2+}/Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, NH_4^+, Sn^{2+}/Sn^{4+} **Anion Radicals** F^-, Cl^-, Br^-, I^-, $S_2O_3^{2-}$, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{3-}, BO_3^{3-}, CrO_4^{2-} / $Cr_2O_7^{2-}$, SCN^-, $[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$, AsO_4^{3-},BrO_3^-, IO_3^-		4 10 14	Chalk and Talk and Hand on Demonstration	**(AS, IS)**
	Practice		2		
		Total	**30**		

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC2-2

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I **Introduction to Quantitative analysis and its interdisciplinary nature**:	Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method- accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD). Limitations of analytical methods.	Douglas A. Skoog, D.M. West , F. james Holler , Stanely R. Crouch, Fundamentals of Analytical Chemistry , Cengage learning India Pvt Ltd. 10th Edition , 2022	4	Chalk and Talk	**(SG)**
	Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance.		3	Chalk and Talk	**(SG)**
	External standard calibration -regression equation (least squares method), correlation coefficient (R^2). Presentation of experimental data and results from the point of view of significant figures.		3	Chalk and Talk	**(SG)**
Module : II **Titrimetric analysis**:	**Principle**, classification, normality, molarity, molality, mole fraction, ppm, ppb etc. Standard solutions, preparationand dilution of reagents/ solutions using $N_1V_1 = N_2V_2$, preparation of ppm level solutions from source materials (salts).	Daniel C. Harris , Quantitative Chemical Analysis , 10th Edition , W.H. Freeman , 2020	2	Chalk and Talk	**(SB)**
	Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base and weak base vs strong acid titrations.		2	Chalk and Talk	**(SB)**
	Redox titrimetry: Theory, balancing redox equations, titration curves.		2	Chalk and Talk	**(SB)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC2-2

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Precipitation titrimetry: Theory, titration curves, indicators for precipitation titrations.		2	Chalk and Talk	**(SB)**
	Complexometric titrimetry: Theory, titration methods employing EDTA (direct, back, displacement and indirect determinations). Indicators for EDTA titrations. Determination of hardness of water.		2	Chalk and Talk	**(AS)**
Module : III	**Water analysis:** Water availability, requirement of water. Quality of surface water and ground water. Impurities in water. Standards of water quality for potable, domestic, industrial and agricultural purpose (color, pH, alkalinity,hardness, TDS,sulphate, fluoride, chloride etc.)	Douglas A. Skoog, D.M. West , F. james Holler , Stanely R. Crouch, Fundamentals of Analytical Chemistry , Cengage learning India Pvt Ltd. 10th Edition , 2022	3	Chalk and Talk	**(AS)**
	Water treatment technologies: House hold water treatment, municipal water treatment and industrial treatment (primary and secondary treatment of industrial effluent). Softening of water. Disinfection of water. Definition and determinations of DO, BOD and COD,and their significance.		3	Chalk and Talk	**(AS)**
	Basic laboratory practices: Basic laboratory practices, calibration of glassware (pipette, burette and volumetric flask), Sampling (solids and liquids), weighing, drying,		4	Chalk and Talk	**(IS)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Interdisciplinary Course (Quantitative Analysis and Basic Laboratory Practices) CHEM-H-IDC2-2

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	dissolving, Acid treatment, Rules of work in analytical laboratory, General rule for performing quantitative determinations (volumetric and gravimetric), Safety in Chemical laboratory, Rules of fire prevention and accidents, First aid. Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.				
		Total	30		
Tutorial:	1. Safety Practices in the Chemistry Laboratory, knowledge about common toxic chemicals and safety measures in their handling, cleaning and drying of glass wares.	Mendham, J., *A. I. Vogel's Quantitative Chemical Analysis* 6th Ed.,	3	Chalk and Talk and Demonstration	**(IS)**
	2. Calibration of glassware, pipette, burette and volumetric flask.		3	Chalk and Talk and Demonstration	**(SG)**
	3. Preparation of TLC plates and separation of amino acids	Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015	3	Chalk and Talk and Demonstration	**(SG)**
	4. Calibration of instruments like colorimeter, pH-meter, conductivity meter, spectrophotometer using referencestandards or reference materials.		3	Chalk and Talk and Demonstration	**(AS)**
	5. Determination of alkali present in soaps/detergents.		3	Chalk and Talk and Demonstration	**(SB)**
		Total	15		

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS),

Paper Name & Code: Interdisciplinary Course (Chemistry In Daily Life) CHEM-MD-IDC-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Dairy Products**	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press , 2021	5	Chalk and Talk	**(SB)**
	Food additives, adulterants, and contaminants		5	Chalk and Talk	**(SB)**
	Artificial food colorants		5	Chalk and Talk	**(SB)**
Module : II	**Vitamins**	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	**(PR)**
	Oils and fats		5	Chalk and Talk	**(PR)**
	Soaps & Detergents		5	Chalk and Talk	**(PR)**
Module : III	**Chemical and Renewable Energy Sources**	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	**(IS)**
	Polymers		10	Chalk and Talk	**(IS)**
		Total	**45**		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	**(SB)**
	2. Determination of Iodine number of oil.		3	Chalk and Talk	**(IS)**
	3. Determination of saponification number of oil.		4	Chalk and Talk	**(PR)**
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	**(IS)**
		Total	**15**		

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (AI for Everyone) CHEM-H-SEC2-2

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module I: Introduction to Artificial Intelligence, Subfields and Technologies	Definition and scope of AI	Russell / Norvig , ARTIFICIAL INTELLIGENCE: A MODERN APPROACH , 4th Edition , Pearson Education, 2022	2	On class demonstrations, study material supplied, modelling and interactive discussions	**(AS)**
	Historical overview and key milestones		2		
	Differentiating AI from human intelligence		2		
	Machine learning: Supervised, unsupervised, and reinforcement learning		3		
	Deep learning and neural networks		3		
	Natural language processing (NLP) and computer vision		3		
Module II: Applications of AI and Ethical and Social Implications of AI	AI in healthcare: Diagnosis, treatment, and medical imaging	Russell / Norvig , ARTIFICIAL INTELLIGENCE: A MODERN APPROACH , 4th Edition , Pearson Education, 2022	1	On class demonstrations, study material supplied, modelling and interactive discussions	**(IS)**
	AI in finance: Fraud detection, algorithmic trading, and risk assessment		2		
	AI in transportation: Autonomous vehicles and traffic optimization		1		
	AI in customer service and chatbots		1		
	AI in education: Personalized learning and intelligent tutoring systems		2		
	Bias and fairness in AI systems		2		
	Privacy and data protection concerns		2		

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Skill Enhancement Course (AI for Everyone) CHEM-H-SEC2-2

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Impact of AI on employment and the workforce		2	As above	**(IS)**
	AI and social inequality		2		
Module III: **Other Important Issues**	Ethical guidelines and responsible AI practices	Russell / Norvig , ARTIFICIAL INTELLIGENCE: A MODERN APPROACH , 4th Edition , Pearson Education, 2022	3	On class demonstrations, study material supplied, modelling and interactive discussions	**(SG)**
	AI and Innovation		4		
	Emerging trends and future directions in AI		4		
	AI and creativity: Generative models and artistic applications		4		
		Total	45		
Project in Artificial Intelligence (A.I.)	At the end of the semester-2, students are required to submit a report which can be based on any topic as given in the appendix 1 of University notification related to this course (CSR/35/2024 dated 24.06.2024).	Russell / Norvig , ARTIFICIAL INTELLIGENCE: A MODERN APPROACH , 4th Edition , Pearson Education, 2022	-	References material, interactive discussions and guidence	**(AS, IS, SG)**

LESSON PLAN: Semester-2 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Ishita Saha (IS),

Paper Name & Code: Skill Enhancement Course (Chemistry In Daily Life) CHEM-MD-SEC-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Dairy Products**	Edward Cox Henry, The Chemical analysis of Foods , Hardcover, Hassell Street Press , 2021	5	Chalk and Talk	**(SB)**
	Food additives, adulterants, and contaminants		5	Chalk and Talk	**(SB)**
	Artificial food colorants		5	Chalk and Talk	**(SB)**
Module : II	**Vitamins**	B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)	5	Chalk and Talk	**(PR)**
	Oils and fats		5	Chalk and Talk	**(PR)**
	Soaps & Detergents		5	Chalk and Talk	**(PR)**
Module : III	**Chemical and Renewable Energy Sources**	Fred Billmeyer : Textbook of polymer science; Wiley 3rd edition.	5	Chalk and Talk	**(IS)**
	Polymers		10	Chalk and Talk	**(IS)**
		Total	**45**		
Tutorial	1. Estimation of Vitamin C		4	Chalk and Talk	**(SB)**
	2. Determination of Iodine number of oil.		3	Chalk and Talk	**(IS)**
	3. Determination of saponification number of oil.		4	Chalk and Talk	**(PR)**
	4. Determination of methyl alcohol in alcoholic beverages.		4	Chalk and Talk	**(IS)**
		Total	**15**		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-4) & Chemistry MDC- II (CHEM-MD-CC2-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Kinetic Theory and Gaseous state:** Concept of pressure and temperature from kinetic theory of gas. Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case	Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011	4	Chalk and Talk	**(IS)**
	Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Wall collision and rate of effusion Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases		4	Chalk and Talk	**(IS)**
	Real gas and Virial equation: Deviation of gases from ideal behavior; Compressibility factor; Boyle temperature; Andrew's and Amagat's plots; van der Waals equation and its features; its derivation and application in explaining real gas behavior ; Existence of critical state, Critical constants in terms of van der Waals constants.	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	**(IS)**
	Law of corresponding states; Virial equation of state; van der Waals equation expressed in the Virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones potential - elementary idea.		3	Chalk and Talk	**(IS)**

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-4) & Chemistry MDC- II (CHEM-MD-CC2-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II	**Chemical Bonding – I:** **i) Ionic bond:** General characteristics, types of ions, size effects, radius ratio rule and its application and limitations. Packing of ions in crystals. Born-Lande equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy. Defects in solids (elementary idea). Solubility energetics of dissolution process. **ii) Covalent bond:** Polarizing power and polarizabilty, ionic potential, Fajan's rules, Lewis structures, formal charge, Valence Bond Theory, The hydrogen molecule (Heitler – London approach), directional character of covalent bonds, hybridizations, equivalent and non-equivalent hybrid orbitals, Bent's rules, dipole moments, VSEPR theory, shapes of molecules and ions containing lone pairs (examples from main group chemistry) and multiple bonding (σ and π bond approach).	i) Atkins, Overton, Rourke , Weller , Armstrong; Shriver & Atkins' Inorganic Chemistry, 5th Ed., Oxford University Press (2010). ii) Lee, J. D. Concise Inorganic Chemistry,5th Ed., Wiley India Pvt. Ltd., 2008	5	Chalk and Talk	**(SG)**
			5	Chalk and Talk	**(SG)**
	Theoretical principles of inorganic qualitative analysis: Basic principles involved in analysis of cations and anions and solubility products, common ion effect. Principle involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.	Svehla & Sivasankar , Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson, 2012.	5	Chalk and Talk	**(SG)**

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-4) & Chemistry MDC- II (CHEM-MD-CC2-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III	**Stereochemistry – II:** Chirotopicityand its relationship with stereogenicity; concept of pseudoasymmetry for ABA type systems. Relative and absolute configuration: *R/S* descriptors; *erythro/threo* and *meso* nomenclature of compounds; *E/Z* descriptors for C=C, combination of *R/S*- and *E/Z* isomerisms.	**Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020**	4	Chalk and Talk	**(PR)**
	Optical activity of chiral compounds: optical rotation, and specific rotation; racemic compounds, racemisation (through cationic, anionic intermediates); resolution of acids and bases *via* diastereomeric salt formation; optical purity and enantiomeric excess.	**Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002**	4	Chalk and Talk	**(PR)**
	General Treatment of Reaction Mechanism -I: **Reactive intermediates:** Carbocations (carbenium and carbonium ions), non-classical carbocations, carbanions, carbon radicals: generation and stability, structure and electrophilic / nucleophilic behaviour of reactive intermediates (elementary idea). **Reaction thermodynamics:** Free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change *via* BDE, intermolecular & intramolecular reactions.	**Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.**	4	Chalk and Talk	**(PR)**
	Reaction kinetics: Rate constant and free energy of activation; free	**Sykes, P. A**	3	Chalk and Talk	**(PR)**

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Priyabrata Roy (PR), Dr Anuva Samanta (AS), Dr Ishita Saha (IS), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry Minor - II (CHEM-H-CC2-4) & Chemistry MDC- II (CHEM-MD-CC2-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	energy profiles for one-step, and two-step reactions; catalyzed reactions, principle of microscopic reversibility; Hammonds postulate. **Substitution Reaction:** Free-radical substitution reaction: halogenation of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammonds postulate.	**guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003.**			
		Total	**45**		
Practical	**Qualitative semimicro analysis of mixtures containing three radicals. Emphasis should be given to the understanding of the chemistry of different reactions (only water /acid soluble salts):** **Cation Radicals** Na^+, K^+, Ca^{2+}, Sr^{2+}, Ba^{2+}, Al^{3+}, Cr^{3+}, Fe^{3+}, Mn^{2+}/Mn^{4+}, Co^{2+}/Co^{3+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, NH_4^+, Sn^{2+}/Sn^{4+} **Anion Radicals** F^-, Cl^-, Br^-, I^-, $S_2O_3^{2-}$, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{3-}, BO_3^{3-}, CrO_4^{2-} / $Cr_2O_7^{2-}$, SCN^-, $[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$, AsO_4^{3-},BrO_3^-, IO_3^-		4 10 14	Chalk and Talk and Hand on Demonstration	**(AS, IS)**
	Practice		2		
		Total	**30**		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Physical Chemistry – II PAPER : CHEM-H-CC7-4-Th Module : I	Transport processes and Liquid State: Diffusion and Viscosity: Diffusion Fick's law, Flux, force, phenomenological coefficients & their inter-relationship (general form),	1.Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004 3. Atkins, P. W. & Paula, J. de, Atkins' Physical	1	Chalk and talk	IS

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	different examples of transport properties	Chemistry, 11th Edition, Oxford University Press, 2018	1		
Module : I	Viscosity General features of fluid flow (streamline flow and turbulent flow); Newton's equation,	1.Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G.	1	Chalk and talk	IS

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	viscosity coefficient; Poiseuille's equation (with derivation); principle of determination of viscosity coefficient of liquids by falling sphere method and using Ostwald's viscometer.	W. Physical Chemistry, Narosa , 2004 3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	1		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Temperature variation of viscosity of liquids and comparison with that of gases. Relation between viscosity coefficient of a gas and mean free path.		1		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
Module : II	Solid State: (12 Lectures) Bravais Lattice and Laws of Crystallography Types of solid, Bragg's law of diffraction; Laws of crystallography (Haüy's law and Steno's law);	1.Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004 3. Atkins, P. W.	3	Chalk and talk	AS

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Permissible symmetry axes in crystals; Lattice, space lattice, unit cell, crystal planes, Bravais lattice. Packing of uniform hard sphere, close packed arrangements (fcc and hcp); Tetrahedral and octahedral voids. Void space in cubic systems	& Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	3		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Crystal plane Distance between consecutive planes [cubic and orthorhombic lattices];	1.Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004 3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press,	1	Chalk and talk	AS
	Indexing of planes, Miller indices; calculation of dhkl;		2		
	Relation between molar mass and unit cell dimension for cubic system; Bragg's law (derivation).		2		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Determination of crystal structure: Powder method; Structure of NaCl and KCl crystals.	2018	1		
Module : III Application of Thermodynamics – II:	Colligative properties Vapour pressure of solution;	1.Denbigh, K. The Principles of Chemical Equilibrium, Cambridge University Press 2.Zemansky, M. W. & Dittman, R.H , Heat and	2	Chalk and talk	IS
	Thermodynamic derivations (using chemical potential)		2		

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Applications in calculating molar masses of normal, dissociated and associated solutes in solution;	Thermodynamics, Special Indian Edition , 8th Edition, Tata-McGraw-Hil ,2017 3. Klotz, Irving M , Rosenberg, Robert M, Chemical Thermodynamics ,Wiley India , 2013	3		
	Abnormal colligative properties.		1		
	Phase Equilibrium: Definitions of phase, component	1.Levine, I. N. Physical Chemistry, 6th	1	Chalk and talk	IS

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	and degrees of freedom; ,	Edition McGraw-Hill India, 2011 2. Castellan, G. W. Physical Chemistry, Narosa , 2004 3. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018			
	Phase rule and its derivations;		1		
	Definition of phase diagram; Phase diagram for water, CO2, Sulphur. Binary solutions:		3		
	Three component systems		3		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
ELECTROCHEMISTRY-II:	Electromotive Force: Rules of oxidation/reduction of ions based on half-cell potentials; Electromotive force of a cell and its measurement .	1.Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018 2. An Introduction To Electrochemistry by Glasstone, Samuel	2	Chalk and talk	AS
	Chemical cells, reversible and irreversible cells with examples		1		

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone and glass electrodes		3		
	Concentration cells with and without transference, liquid		1		

LESSON PLAN: Semester 4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry – II (CHEM-H-CC7-4)

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	junction potential				
	Potentiometric Titration.		1		
PAPER : CHEM-H-CC7-4-P	1. Surface tension measurements using Stalagmometer: 2. Viscosity	. Practical Workbook Chemistry (Honours), UGBOS, Chemistry,	10 10	Chalk and talk	IS

Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	measurement using Ostwald's viscometer: 3. Conductometric Experiments :	University of Calcutta, 2015	10		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-H-CC6-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I Stereochemistry – IV	**Conformation-II** Concept of dihedral angle, torsion angle; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gauche interaction; conformational analysis of ethane, propane, *n*-butane, and 2-methylbutane; 1,2-dihaloalkanes and ethylene glycol.	Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd, 2020	4	Chalk and Talk	
	Concept of prostereoisomerism Prostereogenic centre; concept of (pro)nchirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro-*r* and pro-*s* descriptors of ligands on propseudoasymmetric centre.		4	Chalk and Talk	
	Chirality arising out of stereoaxis Stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, and biphenyls; related configurational descriptors (*Ra/Sa*); atropisomerism; racemisation of chiral biphenyls		4	Chalk and Talk	

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-H-CC6-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II Chemistry of carbonyl Compounds	**Nucleophilic Addition to C=O** Structure and reactivity of carbonyl compounds; mechanism (with evidence), reactivity, equilibrium and kinetic control; formation of hydrates, cyanohydrins and bisulphite adduct; nucleophilic addition-elimination reactions with alcohols, thiolsand nitrogen-based nucleophiles;reactions: benzoin condensation, Cannizzaro and Tischenko reactions, reactions with ylides: Wittig and Corey-Chaykovsky reaction; Rupe rearrangement, oxidations and reductions: Clemmensen, Wolff-Kishner, LiAlH4, NaBH4, MPVO redox equilibrium, acyloin condensation; oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010	10	Chalk and Talk	
	Exploitation of acidity of α-H of C=O Formation of enols and enolates; kinetic and thermodynamic enolates; reactions (mechanism with evidence):halogenation of	1. Finar, I. L. Organic Chemistry	10	Chalk and Talk	

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-H-CC6-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	carbonyl compounds under acidic and basic conditions, Hell-Volhard-Zelinsky (H. V. Z.) reaction, nitrosation, SeO2 (Riley) oxidation; condensations (mechanism with evidence): Aldol,Tollens', Knoevenagel, Claisen-Schmidt, Claisen ester including Dieckmann; Mannich reaction,Perkin reaction; alkylation of active methylene compounds; synthetic applications of diethyl malonate and ethyl acetoacetate; specific enol equivalents (lithium enolates, enamines and silyl enol ethers) in connection with alkylation, acylation and aldol type reaction	(Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010			
	Nucleophilic addition to α,β-unsaturated carbonyl system General principle and mechanism (with evidence); direct and conjugate addition, addition of enolates (Michael reaction), Robinson annulations reaction. **Substitution at sp2 carbon (C=O system)** Mechanism (with evidence): BAC2, AAC2, AAC1, AAL1 (inconnection to acid and ester); acid derivatives: amides, anhydrides & acyl halides (formation and hydrolysis including comparison).		8	Chalk and Talk	

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-H-CC6-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III	**Organometallics** Grignard reagents ,Organolithiums; Gilman cuprates: preparation and reactions (mechanism with evidence); addition of Grignard and organolithium to carbonyl compounds; substitution on -COX; directed *ortho* metalation of arenes using organolithiums, conjugate addition by Gilman cuprates; Corey-House synthesis; abnormal behaviour of Grignard reagents; comparison of reactivity among Grignard, organolithiums and organocopper reagents; Reformatsky reaction; concept of umpolung.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010	5	Chalk and Talk	
		Total	**45**		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-H-CC6-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	**Qualitative analysis of single solid organic compound:** 1. Detection of special elements (N, S, Cl) by Lassaigne's test 2. Solubility and classification (solvents: H2O, 5% HCl, 5% NaOH and 5% NaHCO3) 3. Detection of the following functional groups by systematic chemical tests: aromatic amino (Ar-NH2), aromatic nitro (-NO2), amido (-CONH2, including imide), phenolic –OH, carboxylic acid (-COOH), carbonyl (distinction between -CHO and >C=O); only one test for each functional group is to be reported. Each student, during laboratory session, is required to carry out qualitative chemical tests for all the special elements and the functional groups in known and unknown (at least six) organic compounds.	1 .Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015 2. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry ,5th Edition , Pearson India, 2003	28	Chalk and Talk and Hand on Demonstration	
	Practice		2		
		Total	**30**		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – II (CHEM-H-CC8-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Coordination chemistry)	**Basics of coordination chemistry** Werner's theory, ligands, IUPAC nomenclature, Isomerism (constitutional and stereo isomerism, Geometrical and optical isomerism in square planar and octahedral complexes)	1. J. E. Huheey, E. A. Keiter, R. L. Keiter, Okhil K. Medhi , Principles of Structure and Reactivity, 5th Edition ,Pearson India, 2022 2. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008	5	Chalk and Talk	SB
	Valence bond theory and crystal field theory VB description and its limitations. Elementary Crystal Field Theory: splitting of d^n configurations in octahedral, square planar and tetrahedral fields, crystal field stabilization energy (CFSE) in weak and strong fields; pairing energy. Spectrochemical series. Jahn- Teller distortion. Octahedral site stabilization energy (OSSE). Metal-ligand bonding (MO concept, elementary idea), sigma- and pi-bonding in octahedral complexes (qualitative pictorial approach) and their effects on the oxidation states of transitional metals (examples).		10	Chalk and Talk	SB
	Electronic spectra of complexes and magnetic properties d-d transitions; L-S coupling; qualitative Orgel diagrams for $3d^1$ to $3d^9$ ions. Racah parameter. Selection rules for electronic spectral transitions; spectrochemical series of ligands; charge transfer spectra (elementary idea). Orbital and spin magnetic moments, spin only moments of d^n ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment: super exchange and antiferromagnetic interactions (elementary idea with examples only);		11	Chalk and Talk	SG
Module : II (Supramolecular chemistry)	Hydrogen bonding. Non-covalent interactions – examples of Ion-Dipole Interactions, Dipole-Dipole interactions, Dipole-Induced Dipole and Ion-Induced Dipole nteractions, van der Waals or Dispersion Interactions, Halogen bonding, Cation- interactions, Anion-pi interactions, pi - pi interactions, Aromatic-Aromatic Interactions: Edge-to face *vs* pi-pi Stacking Interactions, N-H- pi interactions, Sulfur-aromatic interactions.	J-M Lehn , Supramolecular Chemistry	8	Chalk and Talk	SB
Module : III	**Basic principle of redox reactions** Ion-electron method of balancing equation of redox reaction. Elementary idea on	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition,	5	Chalk and Talk	SG

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – II (CHEM-H-CC8-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
(Redox reactions)	standard redox potentials with sign conventions. Nernst equation (without derivation). Influence of complex formation, precipitation and change of pH on redox potentials; formal potential.	Pearson India ,2002			
	Redox titrations Feasibility of a redox titration, redox potential at the equivalence point, redox indicators. Redox potential diagram (Latimer and Frost diagrams) of common elements and their applications. Disproportionation and comproportionation reactions (typical examples).	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	6	Chalk and Talk	SG
		Total	45		
Practical	**Estimation of mixtures of metal ions:** 1. Estimation of Fe^{3+} and Cu^{2+} in a mixture. 2. Estimation of Fe^{3+} and Cr^{3+} in a mixture. 3. Estimation of Fe^{3+} and $Cr_2O_7^{2-}$ in a mixture. 4. Estimation of Fe^{3+} and Mn^{2+} in a mixture. 5. Estimation of Cr^{3+} and Mn^{2+} in a mixture.	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SB)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – I (CHEM-H-CC5-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Chemical bonding –II)	**Molecular orbital concept of bonding:** The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach): sigma and pi bonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing,. MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+, CN^-, HF, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	18	Chalk and Talk	SB
	Metallic Bond Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.		5	Chalk and Talk	SB
	Weak Chemical Forces Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogen bonds. Effects of chemical force, melting and boiling points.		5	Chalk and Talk	SG
Module : II (Acids and bases)	**Acid-Base concept** Arrhenius concept, theory of solvent system (in H_2O, NH_3, SO_2 and HF), Bronsted-Lowry's concept, Lux Flood concept, Lewis concept, group characteristics of Lewis acids, solvent levelling and differentiating effects. Relative strength of acids, Pauling's rules. HSAB principle.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	6	Chalk and Talk	SG
	Acid-base equilibria in aqueous solution: Proton transfer equilibria in water, pH, buffer. Acid-base neutralization curves; indicator, choice of indicators.		6	Chalk and Talk	SG
Module : III (Radioactivity)	**Nuclear stability:** Nuclear stability and nuclear binding energy. **Nuclear Reactions:** Artificial radioactivity, fission, fusion and spallation. **Radiocarbon dating**	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	5	Chalk and Talk	SG
		Total	**45**		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – I (CHEM-H-CC5-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	**Complexometric Titration** 1. Ca(II) and Mg(II) in a mixture 2. Hardness of water 3. Fe(III) and Al(III) in a mixture 4. Cu(II) and Zn(II) in a mixture 5. Cu(II) and Ni(II) in a mixture	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SG)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry MDC-IV (CHEM-MD-CC4-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Chemical bonding –II)	**Molecular orbital concept of bonding:** The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach): sigma and pi bonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing,. MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+, CN^-, HF, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	18	Chalk and Talk	SB
	Metallic Bond Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.		5	Chalk and Talk	SB
	Weak Chemical Forces Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogen bonds. Effects of chemical force, melting and boiling points.		5	Chalk and Talk	SG
Module : II (Acids and bases)	**Acid-Base concept** Arrhenius concept, theory of solvent system (in H_2O, NH_3, SO_2 and HF), Bronsted-Lowry's concept, Lux Flood concept, Lewis concept, group characteristics of Lewis acids, solvent levelling and differentiating effects. Relative strength of acids, Pauling's rules. HSAB principle.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	4	Chalk and Talk	SG
	Thermodynamic acidity parameters Drago-Wayland equation. Superacids, Gas phase acidity and proton affinity		4	Chalk and Talk	SG
	Acid-base equilibria in aqueous solution: Proton transfer equilibria in water, pH, buffer. Acid-base neutralization curves; indicator, choice of indicators.		4	Chalk and Talk	SG
Module : III	**Nuclear stability:** Nuclear stability and nuclear binding energy. **Nuclear**	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition,	5	Chalk and	SG

LESSON PLAN: Semester-4 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Chemistry MDC-IV (CHEM-MD-CC4-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
(Radioactivity)	**Reactions:** Artificial radioactivity, fission, fusion and spallation. **Radiocarbon dating**	Pearson India ,2002		Talk	
		Total	**45**		
Practical	**Complexometric Titration** 1. Ca(II) and Mg(II) in a mixture 2. Hardness of water 3. Fe(III) and Al(III) in a mixture 4. Cu(II) and Zn(II) in a mixture 5. Cu(II) and Ni(II) in a mixture	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SG)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module: I Thermodynamics -II	**Second Law**: Need for a Second law; statement of the second law of thermodynamics; Concept of heat reservoirs and heat engines; Carnot cycle; Carnot engine and refrigerator; Kelvin – Planck and Clausius statements and equivalence of the two statements with entropic formulation; Carnot's theorem; Values of §dQ/T and Clausius inequality; Physical concept of Entropy; Entropy is a measure of the microscopic disorder of the system. Entropy change of systems and surroundings for various processes and transformations; Entropy and unavailable work; Temperature – Entropy diagram. Useful work and The Gibbs and Helmholtz function. Changes at constant T, P. Application to electric work. Criteria for spontaneity and equilibrium. Gibbs-Helmholtz equation, The Gibbs Function and useful work in Biological systems. Gibbs free energy and spontaneous phase transition. Maxwell's relations; Joule-Thomson experiment and its consequences; inversion temperature; Joule-Thomson	Castellan, G. W. *Physical Chemistry*, Narosa	15	On class demonstrations using chalk and board, interactive discussions	IS

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	coefficient for a van der Waals gas; General heat capacity relations				
	Systems of Variable Compositions: State functions for system of variable compositions. Criteria of equilibrium and spontaneity in systems of variable composition. Partial molar quantities, dependence of thermodynamic parameters on composition; Chemical potential as an escaping tendency. Gibbs-Duhem equation, Entropy and Gibbs function for mixing of ideal gases, the chemical potential of ideal mixtures. The Fugacity function of a pure real gas. Calculation of the fugacity of a van der Waals gas using compressibility factor. Definitions of Activities and activity coefficients. Choice of standard states.	Kapoor K.L, A Text Book Of Physical Chemistry, McGraw Hill India	5	On class demonstrations using chalk and board, interactive discussions	IS
Module: II **Applications of Thermodynamics – I**	**Chemical Equilibrium**: Thermodynamic conditions for equilibrium, degree of advancement; van't Hoff's reaction isotherm (deduction from chemical potential); Variation of free energy with	Denbigh, K. *The Principles of Chemical Equilibrium* ,Cambridge	6	On class demonstrations using chalk and board, interactive discussions	IS

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	degree of advancement; Equilibrium constant and standard Gibbs free energy change; Van't Hoff's reaction isobar and isochore from different standard states; Le Chatelier's principle and its derivation, variation of equilibrium constant under different conditions. Nernst's distribution law; Application- (eg. dimerization of benzene in benzoic acid). Solvent Extraction.				
Module: III **ELECTROCHEMISTRY-I** **(i) Conductance**	Ion conductance; Conductance and measurement of conductance, cell constant, specific conductance and molar conductance; Variation of specific and equivalent conductance with dilution for strong and weak electrolytes; Kohlrausch's law of independent migration of ions; Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes; Debye – Huckel theory of Ion atmosphere	Castellan, G. W. *Physical Chemistry*, Narosa Glasstone, S. & Lewis, G.N. *Elements of Physical Chemistry*	9	On class demonstrations, study material supplied, modelling and interactive discussions	AS

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	(qualitative)-asymmetric effect, relaxation effect and electrophoretic effect; Debye-Huckel limiting law-brief qualitative description. Estimation of activity coefficient for electrolytes using Debye-Huckel limiting law. Ostwald's dilution law; Ionic mobility; Application of conductance measurement (determination of solubility product and ionic product of water); Conductometric titrations. Transport number, Principles of Hittorf's and Moving-boundary method; Wien effect, Debye-Falkenhagen effect, Walden's rule				
(ii) Ionic equilibrium	Strong, moderate and weak lectrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment). Salt hydrolysis - calculation of hydrolysis	Atkins, P. W. & Paula, J. de *Atkins' Physical Chemistry*, 10th Edition, Oxford University Press	8	On class demonstrations, study material supplied, modelling and interactive discussions	AS

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	constant, degree of hydrolysis and pH for different salts (exact Treatment). Determination of hydrolysis constant conductometrically. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations. Multistage equilibrium in polyelectrolyte systems; hydrolysis and hydrolysis constants				
CHEM-MD-CC5-4-P	**Experiment 1**: Determination of rate constant of the reaction between H_2O_2 and acidified KI solution using Clock reaction. **Experiment 2**: Determination of the rate constant for the decomposition of H_2O_2 using $FeCl_3$ as catalyst. **Experiment 3**: Determination of the rate constant for the first order acid catalyzed hydrolysis of an ester.	***Practical Workbook Chemistry (Honours), UGBS, Chemistry*, University of Calcutta, 2015**	**30**	On class explanation, experimental practice in laboratory	AS+IS

LESSON PLAN: Semester-4 (CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr. Ishita Saha (IS)

Paper Name & Code: CHEM-MD-CC5-4-Th

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Experiment 4: To study the kinetics of the inversion of cane sugar using a polarimeter				
		TOTAL	**45(TH)+30 (PR)=75**		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – II (CHEM-MD-CC8-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Coordination chemistry)	**Basics of coordination chemistry** Werner's theory, ligands, IUPAC nomenclature, Isomerism (constitutional and stereo isomerism, Geometrical and optical isomerism in square planar and octahedral complexes)	1. J. E. Huheey, E. A. Keiter, R. L. Keiter, Okhil K. Medhi , Principles of Structure and Reactivity, 5th Edition ,Pearson India, 2022 2. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008	5	Chalk and Talk	SB
	Valence bond theory and crystal field theory VB description and its limitations. Elementary Crystal Field Theory: splitting of d^n configurations in octahedral, square planar and tetrahedral fields, crystal field stabilization energy (CFSE) in weak and strong fields; pairing energy. Spectrochemical series. Jahn- Teller distortion. Octahedral site stabilization energy (OSSE). Metal-ligand bonding (MO concept, elementary idea), sigma- and pi-bonding in octahedral complexes (qualitative pictorial approach) and their effects on the oxidation states of transitional metals (examples).		10	Chalk and Talk	SB
	Electronic spectra of complexes and magnetic properties d-d transitions; L-S coupling; qualitative Orgel diagrams for $3d^1$ to $3d^9$ ions. Racah parameter. Selection rules for electronic spectral transitions; spectrochemical series of ligands; charge transfer spectra (elementary idea). Orbital and spin magnetic moments, spin only moments of d^n ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment: super exchange and antiferromagnetic interactions (elementary idea with examples only);		11	Chalk and Talk	SB
Module : II (Supramolecular chemistry)	Hydrogen bonding. Non-covalent interactions – examples of Ion-Dipole Interactions, Dipole-Dipole interactions, Dipole-Induced Dipole and Ion-Induced Dipole nteractions, van der Waals or Dispersion Interactions, Halogen bonding, Cation- interactions, Anion-pi interactions, pi - pi interactions, Aromatic-Aromatic Interactions: Edge-to face *vs* pi-pi Stacking Interactions, N-H- pi interactions, Sulfur-aromatic interactions.	J-M Lehn , Supramolecular Chemistry	8	Chalk and Talk	SB
Module : III	**Basic principle of redox reactions** Ion-electron method of balancing equation of redox reaction. Elementary idea on	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition,	5	Chalk and Talk	SB

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – II (CHEM-MD-CC8-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
(Redox reactions)	standard redox potentials with sign conventions. Nernst equation (without derivation). Influence of complex formation, precipitation and change of pH on redox potentials; formal potential.	Pearson India ,2002			
	Redox titrations Feasibility of a redox titration, redox potential at the equivalence point, redox indicators. Redox potential diagram (Latimer and Frost diagrams) of common elements and their applications. Disproportionation and comproportionation reactions (typical examples).	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	6	Chalk and Talk	SB
		Total	45		
Practical	**Estimation of mixtures of metal ions:** 1. Estimation of Fe^{3+} and Cu^{2+} in a mixture. 2. Estimation of Fe^{3+} and Cr^{3+} in a mixture. 3. Estimation of Fe^{3+} and $Cr_2O_7^{2-}$ in a mixture. 4. Estimation of Fe^{3+} and Mn^{2+} in a mixture. 5. Estimation of Cr^{3+} and Mn^{2+} in a mixture.	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SB)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry - IV (CHEM-H-CC13-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module: I Exactly Solvable Systems -2	**Quantum Harmonic Oscillator:** Setting up of One-dimensional Schrödinger equation. Solving Hermite differential equation, Algebraic solution for the ground and excited states of QHO. Classical turning points, Expectation values of x, x^2, p_x and $p_x{}^2$. **Rigid Rotator:** Commutation rules of angular momentum, Angular Momentum operators in spherical polar coordinates. Quantization of square of total angular momentum and z-component; Rigid rotator model of rotation of diatomic molecule; Schrödinger equation, transformation to spherical polar coordinates; Separation of variables. Spherical harmonics; Discussion of solution **Hydrogen atom and hydrogen-like ions:** Setting up of Schrödinger equation in spherical polar coordinates, Separation of variables, Solution of angular Part (φ part only), quantization of energy (only final energy expression); Real wave functions. Average and most probable distances of electron from nucleus; Setting up of Schrödinger equation for many-electron atoms (He, Li)	1. Levine, I. N. Physical Chemistry, 6th Edition, McGraw-Hill India ,2011. 2. McQuarrie, D. A. & Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press,1997. 3. Levine, I.N, Quantum Chemistry, 7th Edition, Pearson,2016. 4. McQuarrie, D.A, Quantum Chemistry, 2nd Edition, University Science Books, 2008.	15	Chalk and Talk Study material given	**AS**

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry - IV (CHEM-H-CC13-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module: II	**Molecular Spectroscopy:** Interaction of electromagnetic radiation with molecules and various types of spectra; **Rotation spectroscopy:** Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution **Vibrational spectroscopy**: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, Diatomic vibrating rotator, P, Q, R branches **Electronic Spectroscopy:** Potential energy curves (diatomic molecules), Frank-Condon principle and vibrational structure of electronic spectra; Frank Condon factor. Bond dissociation and principle of determination of dissociation energy (ground state); Decay of excited states by radiative and non- radiative paths; Pre-dissociation; Fluorescence and phosphorescence, Jablonskii diagram; **Raman spectroscopy:**	1. Colin Banwell and Elaine McCASH, Fundamentals of Molecular Spectroscopy, 6th Edition Affiliated East-West Press ,2024. 2. Barrow, G. M. Molecular Spectroscopy, McGraw-Hill, 1962.	20	Chalk and Talk	**IS**

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry - IV (CHEM-H-CC13-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Classical Treatment. Rotational Raman effect; Vibrational Raman spectra, Stokes and antiStokes lines; their intensity difference, rule of mutual exclusion				
Module: III	**Photochemistry:** Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients; Laws of photochemistry, Stark-Einstein law of photochemical equivalence quantum yield, actinometry, examples of low and high quantum yields **Rate of Photochemical processes:** Photochemical equilibrium and the differential rate of photochemical reactions, Photo stationary state; HI decomposition, H_2-Br_2 reaction, dimerization of anthracene; photosensitized reactions, quenching, Stern-Volmer equation. Role of photochemical reactions in biochemical processes.	1. Colin Banwell and Elaine McCASH, Fundamentals of Molecular Spectroscopy, 6th Edition Affiliated East-West Press ,2024. 2. Barrow, G. M. Molecular Spectroscopy, McGraw-Hill, 1962.	10	Chalk and Talk and Study material given	**AS**
		Total	**45**		
Practical	Using Spreadsheet Software 1. Determination of Molar Enthalpy of Vaporization using Linear and Non-Linear Least squares fit. 2. Calculation and Plotting of a Precipitation Titration Curve with MS Excel.		25	Chalk and Talk and Hand on Demonstrat	**AS**

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry - IV (CHEM-H-CC13-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	3. Acid-Base Titration Curve using Excel Goal Seek Function. 4. Plotting of First and Second Derivative Curve for pH metric and Potentiometric titration. 5. Use of spreadsheet to solve the 1D Schrodinger Equation (Numerov Method), Particle in a box. 6. Michaelis-Menten Kinetics for Enzyme Catalysis using Linear and Non - Linear Regression. 7. Roots of equation –Newton-Raphson method. (e.g volume of van der Waals gas and comparison with ideal gas, pH of a weak acid) 8. Numerical Integration using Simpson's 1/3rd rule and Trapezoidal rule. (e.g. entropy/enthalpy change from heat capacity data), (probability distributions (gas, kinetic theory) and mean values)			ion using Excel	
	Practice		5		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha(IS), Dr Priyabrata Roy(PR)

Paper Name & Code: FUNDAMENTALS OF CHEMISTRY – III (CHEM-H-DSCC14-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Chemistry of Biomolecules:)	**Monosaccharides:** Aldoses up to 6 carbons; structure of D-glucose & D-fructose (configuration & conformation); ring structure of monosaccharides (furanose and pyranose forms): Haworth representations and non-planar conformations; anomeric effect (including stereoelectronic explanation); mutarotation; epimerization; reactions (mechanisms in relevant cases with D-glucose only): Fischer glycosidation, osazone formation (comparison with mannose & fructose), bromine-water oxidation, HNO3 oxidation, selective oxidation of terminal –CH2OH of aldoses, reduction to alditols, Lobry de Bruyn-van Ekenstein rearrangement; stepping–up (Kiliani-Fischer method) and stepping–down (Ruff's method) of aldoses; end-group-interchange of aldoses; acetonide (isopropylidene and benzylidene protections).	1. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2004. 2. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2012. 3. Loudon, G. M. Organic Chemistry, Oxford University Press 4th Edition, 2002	7	Chalk and Talk	PR
	Amino acids: Synthesis with mechanistic details: Strecker, Gabriel; acetamido malonic ester, azlactone, Bücherer hydantoin synthesis, synthesis involving diketopiperizine, isoelectric point, zwitter ions; electrophoresis, reaction (with mechanism): ninhydrin reaction, Dakin-West reaction. **Peptides:** Peptide linkage and its geometry; syntheses (with mechanistic details) of peptides using N protection & C-protection, solid-phase (Merrifield) synthesis; peptide sequence: C-terminal and N-terminal unit determination (Edman, Sanger and 'dansyl' methods); partial hydrolysis. **Nucleic acids:** pyrimidine and purine bases (only structure & nomenclature); nucleosides and nucleotides corresponding to DNA and RNA; elementary idea of double helical structure of DNA (Watson Crick model); complimentary base–pairing in DNA.		8	Chalk and Talk	PR

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha(IS), Dr Priyabrata Roy(PR)

Paper Name & Code: FUNDAMENTALS OF CHEMISTRY – III (CHEM-H-DSCC14-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II (Statistical Thermodynamics)	**Statistical Thermodynamics: The Boltzmann Distribution** Microstates and Configurations. Counting Microstates and weights. The dominant configuration. Derivation of the Boltzmann Distribution law. Molecular partition function and its significance. Degeneracy. Physical meaning of the Boltzmann Distribution law. Thermodynamic probability and Entropy. Barometric formula from Boltzmann Distribution. **Ensemble and Molecular Partition function** The concept of ensemble. The Canonical, Micro canonical and Grand Canonical ensemble. Relations between Molecular partition function and Canonical partition function for (i) distinguishable independent molecules and, (ii) indistinguishable independent molecules. Molecular energy levels. Translational partition function, Rotational partition function for diatomic molecules and Vibrational partition function. Thermodynamic variables and partition function Internal energy and partition function. Entropy and partition function. Relations between derived thermodynamic variables and partition function. Residual entropy. Applications Application to chemical/ionization equilibrium, Equipartition principle. Gibbs paradox. Blackbody radiation.	1. Levine, I. N. Physical Chemistry, 6th Edition ,2011, McGraw-Hill India. 2. McQuarrie, D. A. & Simons, J. D. Physical Chemistry: A Molecular Approach, Viva Press.	8	Chalk and Talk	IS

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha(IS), Dr Priyabrata Roy(PR)

Paper Name & Code: FUNDAMENTALS OF CHEMISTRY – III (CHEM-H-DSCC14-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	3rd law of thermodynamics Absolute entropy, Plank's law, Calculation of entropy, Nernst heat theorem Adiabatic demagnetization Approach to zero Kelvin, adiabatic cooling, demagnetization, adiabatic demagnetization – involved curves. Specific heat of Solids Coefficient of thermal expansion, thermal compressibility of solids; Dulong –Petit's law; Perfect Crystal model, Einstein's theory – derivation from partition function, limitations; Debye's T3 law – analysis at the two extremes		7	Chalk and Talk	AS
Module : III (Silicate Materials of Industrial Importance)	**Glass:** Glassy state and its properties, Manufacture and processing of glass, composition and properties of the following types of glasses: sodalime glass, potash glass, lead glass, borosilicate glass, fluorosilicate glass, tempered glass, armoured glass, coloured glass, photochromatic glass.	1. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi. 2. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi. 3. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.	4	Chalk and Talk	SB
	Ceramics: Important clays and feldspar, types and manufacture of ceramics, high technology ceramics and their applications, super conducting and semi conducting oxides.		4	Chalk and Talk	SB
	Cements: Classification of cements, ingredients and their roles, manufacture of cements and the setting process, quick setting cement.		4	Chalk and Talk	SB
	Chemical Explosives: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX), introduction to rocket propellants.		3	Chalk and Talk	SB
		Total	**45**		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Anuva Samanta(AS), Dr Ishita Saha(IS), Dr Priyabrata Roy(PR)

Paper Name & Code: FUNDAMENTALS OF CHEMISTRY – III (CHEM-H-DSCC14-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	Spectroscopy (1H-NMR and IR) Spectroscopic Analysis of Organic Compounds 1. Assignment of labelled peaks in the 1H NMR spectra of the known organic compounds explaining the relative δ-values and splitting pattern. 2. Assignment of labelled peaks in the IR spectrum of the same compound with the nature of the bands (C-H, O-H, N-H, C-O, C-N, C-X, C=C, C=O, N=O, C≡C, C≡N stretching frequencies) 3. The students must record full spectral analysis of compounds from the following list: (i) 4′-Bromoacetanilide (ii) 2-Bromo-4'-methylacetophenone (iii) Vanillin (iv) 2′- Methoxyacetophenone (v) Salicylamide (vi) 2′- Hydroxyacetophenone (vii) trans-Cinnamic acid (viii) 4′-Methylacetanilide (ix) 3-nitroanisole (x) 2,3-Dimethylbenzonitrile (xi) Pent-1-yn-3-ol (xii) 3-Nitrobenzaldehyde (xiii) 3-Aminobenzoic acid (xiv) Ethyl 3- aminobenzoate (xv) Ethyl 4 aminobenzoate.	1. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015.	28	Chalk and Talk and Hand on Demonstration	PR
	Practice		2		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – IV (CHEM-H-DSCC15-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Organometallic Chemistry–I)	Definition and classification of organometallic compounds based on bond type. Concept of hapticity.18-electron and 16-electron rules and its stability (pictorial MO approach). Applications of 18-electron rule to transition metal organometallic complexes.	1. F.A. Cotton, G.W. Wilkinson, C.A. Murillo, M. Bochmann, Advanced Inorganic Chemistry, Wiley, 6e, 1999 2.. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 3. James E. Huheey / Ellen A. Keiter/ Richard L. Keiter/ Okhil K. Medhi Inorganic Chemistry, Principles of Structure and Reactivity 5th Ed., Pearson,2022.	3	Chalk and Talk	SG
	General methods of preparation of mono and binuclear carbonyls of 3d series. Structures of mono-, bi-, tri- and tetranuclear carbonyls. Different binding modes of CO and NO with examples. Comparison of σ-donor and π-acceptor behavior of CO, NO and CN^-. Synergistic effect and its interpretation through IR spectra. Bonding of iron nitrosyl (brown ring) complex as a special case. Zeise's salt: preparation, structure, bonding. Ferrocene: Structure, preparation, properties and reactions (acetylation, alkylation, oxidation, nitration, halogenation, metalation, Mannich condensation).		12	Chalk and Talk	SG
	Reactions of organometallic complexes: ligand dissociation, substitution, oxidative addition, reductive elimination, migration and insertion reactions. Organometallic catalysis–Homogeneous and Heterogeneous- Industrial importance-hydroformylation, hydrogenation of alkenes by Wilkinson's catalyst (Tolman catalytic loop), Ziegler – Natta polymerization.		10	Chalk and Talk	SG
Module : II (Bioinorganic Chemistry – I)	Elements of life: essential and beneficial elements, major, trace and ultra-trace elements. Basic chemical reactions in biological systems and the role of metal ions (specially Na^+, K^+, Mg^{2+}, Ca^{2+}, $Fe^{3+/2+}$, $Cu^{2+/1+}$, Zn^{2+} and $Mo^{3+/4+/6+}$) in biology. Dioxygen management proteins: Hemoglobin, Myoglobin, Hemocyanin and Hemerythrin. Electron Transport Proteins: Ferredoxins (2Fe-2S, 4Fe-4S, Reiske protein), Cytochrome C and Cytochrome C oxidase.	1. James E. Huheey / Ellen A. Keiter/ Richard L. Keiter/ Okhil K. Medhi Inorganic Chemistry, Principles of Structure and Reactivity 5 thEd., Pearson,2022.	10	Chalk and Talk	SB

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry – IV (CHEM-H-DSCC15-6)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III (Reaction kinetics and mechanism)	Thermodynamic and kinetic stability. Significance of LFAE, Inert and Labile complexes. Substitution reaction pathways. Mechanism of nucleophilic substitution in square planar and octahedral complexes. Trans- effect and trans influence and its application in complex synthesis. Explanation of trans-effect through MO approach. Electron transfer reactions (basic ideas of Inner sphere and Outer sphere mechanisms).	1.James E. Huheey / Ellen A. Keiter/ Richard L. Keiter/ Okhil K. Medhi Inorganic Chemistry, Principles of Structure and Reactivity 5 thEd., Pearson,2022.	10	Chalk and Talk	SB
		Total	**45**		
Practical	**Preparation of Inorganic Complexes** **1.cis-K[Cr(C_2O_4)$_2$(H_2O)$_2$], 2. [Co(NH_3)$_4$(CO_3)]Cl, 3.[Ni(en)$_3$]Cl_2, 4. [Fe(acac)$_3$], 5. [Cu(acac)$_2$], 6.[VO(acac)$_2$], 7. [Ni(salen)]$_2$ [salen = synthesised by condensation of salicylaldehyde and ethylenediamaine]**	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SG)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-II (CC-7)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I Transport processes and liquid state	Diffusion Fick's law, Flux, force, phenomenological coefficients & their inter-relationship (general form), different examples of transport properties	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201 2. Castellan, G. W. Physical Chemistry, Narosa, 2004	5	Chalk and Talk	IS
	Viscosity General features of fluid flow (streamline flow and turbulent flow); Newton's equation, viscosity coefficient; Poiseuille's equation (with derivation); principle of determination of viscosity coefficient of liquids by falling sphere method and using Ostwald's viscometer. Temperature variation of viscosity		2	Chalk and Talk	IS
	Surface tension and energy (4 Lectures) Surface tension, surface energy, excess pressure, capillary rise and surface tension; Work of cohesion and adhesion, spreading of liquid over other surface; Vapour pressure over curved surface; Temperature dependence of surface tension		2	Chalk and Talk	IS
			2	Chalk and Talk	IS
Module : II (Solid State**)**	Types of solid, Bragg's law of diffraction; Laws of crystallography (Haüy's law and Steno's law); Permissible symmetry axes in crystals; Lattice, space lattice, unit cell, crystal planes, Bravais lattice. Packing of uniform hard sphere,	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201	3	Chalk and Talk	AS

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-II (CC-7)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	close packed arrangements (fcc and hcp); Tetrahedral and octahedral voids. Void space in cubic systems				
Module : II (Solid State**)**	Crystal plane Distance between consecutive planes [cubic and orthorhombic lattices]; Indexing of planes, Miller indices; calculation of dhkl; Relation between molar mass and unit cell dimension for cubic system; Bragg's law (derivation). Determination of crystal structure: Powder method; Structure of NaCl and KCl crystals.	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201	3	Chalk and Talk	AS
Module: III(Application of Thermodynamics – II)	Colligative properties Vapour pressure of solution; Ideal solution, ideally dilute solution and colligative properties; Raoult's law. Thermodynamic derivations (using chemical potential) relating (i) Elevation of boiling point of an ideally dilute solution containing a non- volatile nonelectrolyte solute, (ii) Depression of freezing point of an ideally dilute solution containing a non - volatile nonelectrolyte solute (iii) Osmotic pressure of an ideally dilute solution containing a nonvolatile nonelectrolyte solute with the molality / molar concentration of solute in solution.	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201 2. Castellan, G. W. Physical Chemistry, Narosa , 2004	4	Chalk and Talk	IS
	Phase Rule Definitions of phase, component and degrees of freedom; Phase rule and its derivations; Definition of phase diagram; Phase diagram for water, CO2, Sulphur. First order phase transition and Clapeyron equation; Clausius- Clapeyron	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201	4	Chalk and Talk	IS

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-II (CC-7)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	equation - derivation and use; Ehrenfest Classification of phase transition.				
	Binary solutions Liquid vapour equilibrium for two component systems. Ideal solution at fixed temperature and pressure; Lever Rule. Principle of fractional distillation; Duhem-Margules equation; Henry's law; Konowaloff's rule; Positive and negative deviations from ideal behaviors; Azeotropic solution; Liquid-liquid phase diagram using phenol- water system; Solid-liquid phase diagram; Eutectic mixture	Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	IS
	ELECTROCHEMISTRY-II: (8 Lectures) Electromotive Force: Rules of oxidation/reduction of ions based on half-cell potentials, Chemical cells, reversible and irreversible cells with examples; Electromotive force of a cell and its measurement, Thermodynamic derivation of Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone and glass electrodes. Concentration cells with and without transference, liquid junction potential; Potentiometric Titration	Castellan, G. W. Physical Chemistry, Narosa , 2004	4	Chalk and Talk	IS

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-II (CC-7)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	1. Surface tension measurements using Stalagmometer 2. Viscosity measurement using Ostwald's viscometer 3. Conductometric Experiments	1.Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	30	Chalk and Talk and Hand on Demonstration	**AS**
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-I (MN-3)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I Thermodynamics II	Thermodynamics II Need for a Second law; Carnot cycle Values of §dQ/T and Clausius inequality; Physical concept of Entropy; Entropy and unavailable work; Temperature – Entropy diagram. Useful work and The Gibbs and Helmholtz function. Changes at constant T, P. Application to electric work. Criteria for spontaneity and equilibrium.	1 Levine, I. N. Physical Chemistry, 6th Edition McGraw-Hill India, 201 2. Castellan, G. W. Physical Chemistry, Narosa, 2004	12	Chalk and Talk	IS
	Systems of Variable Compositions State functions for system of variable compositions. Criteria of equilibrium and spontaneity in systems of variable composition.		3	Chalk and Talk	IS
	Partial molar quantities, dependence of thermodynamic parameters on composition; Chemical potential as an escaping tendency. Gibbs-Duhem equation, Entropy and Gibbs function for mixing of ideal gases, the chemical potential of ideal mixtures.		5	Chalk and Talk	IS
Module : II (Applications of Thermodynamics – I)	Chemical Equilibrium Thermodynamic conditions for equilibrium, degree of advancement; van't Hoff's reaction isotherm (deduction from chemical potential);	1Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018	4	Chalk and Talk	SB

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-I (MN-3)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Variation of free energy with degree of advancement; Equilibrium constant and standard Gibbs free energy change;	Denbigh, K. The Principles of Chemical Equilibrium, Cambridge University Press			
	Van't Hoff's reaction isobar and isochore from different standard states; Le Chatelier's principle and its derivation, variation of equilibrium constant under different conditions Nernst's distribution law;		2	Chalk and Talk	IS
	Application- (e.g. dimerization of benzene in benzoic acid). Solvent Extraction.		2	Chalk and Talk	IS
Module : III (Electrochemistry-I)	**Conductance** Ion conductance; Conductance and measurement of conductance, cell constant, specific conductance and molar conductance; Variation of specific and equivalent conductance with dilution for strong and weak electrolytes; Kohlrausch's law of independent migration of ions;		3	Chalk and Talk	AS
	Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes; Debye –Huckel theory of Ion atmosphere (qualitative)-asymmetric effect, relaxation effect and electrophoretic effect; Debye-Huckel limiting law-brief qualitative description. Estimation of activity coefficient for electrolytes using Debye-Huckel limiting law. Ostwald's dilution law; Ionic mobility;		**3**	Chalk and Talk	

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Anuva Samanta (AS), Dr Ishita Saha (IS)

Paper Name & Code: Physical Chemistry-I (MN-3)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	**Complexometric Titration** 1. Ca(II) and Mg(II) in a mixture 2. Hardness of water 3. Fe(III) and Al(III) in a mixture 4. Cu(II) and Zn(II) in a mixture 5. Cu(II) and Ni(II) in a mixture	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SB)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry-I (MN-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I (Chemical bonding –II)	**Molecular orbital concept of bonding:** The approximations of the theory, Linear combination of atomic orbitals (LCAO) (elementary pictorial approach): sigma and pi bonds and delta interaction, multiple bonding. Orbital designations: gerade, ungerade, HOMO, LUMO. Orbital mixing,. MO diagrams of H_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, and their ions wherever possible; Heteronuclear molecular orbitals: CO, NO, NO^+, CN^-, HF, BeH_2, CO_2 and H_2O. Bond properties: bond orders, bond lengths.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	18	Chalk and Talk	SB
	Metallic Bond Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.		5	Chalk and Talk	SB
	Weak Chemical Forces Hydrogen bonding (theories of hydrogen bonding, valence bond treatment), receptor-guest interactions, Halogen bonds. Effects of chemical force, melting and boiling points.		5	Chalk and Talk	SB
Module : II (Acids and bases)	**Acid-Base concept** Arrhenius concept, theory of solvent system (in H_2O, NH_3, SO_2 and HF), Bronsted-Lowry's concept, Lux Flood concept, Lewis concept, group characteristics of Lewis acids, solvent levelling and differentiating effects. Relative strength of acids, Pauling's rules. HSAB principle.	1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry , 3rd Edition, Pearson India, 2008 2. A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition, Pearson India ,2002	4	Chalk and Talk	SB
	Thermodynamic acidity parameters Drago-Wayland equation. Superacids, Gas phase acidity and proton affinity		4	Chalk and Talk	SB
	Acid-base equilibria in aqueous solution: Proton transfer equilibria in water, pH, buffer. Acid-base neutralization curves; indicator, choice of indicators.		4	Chalk and Talk	SB
Module : III	**Nuclear stability:** Nuclear stability and nuclear binding energy. **Nuclear**	A. G. Sharpe, C. E. Housecroft, Inorganic Chemistry 3rd Edition,	5	Chalk and	SB

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Sharmila Bhattacharya (SB), Dr Soumavo Ghosh (SG)

Paper Name & Code: Inorganic Chemistry-I (MN-4)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
(Radioactivity)	**Reactions:** Artificial radioactivity, fission, fusion and spallation. **Radiocarbon dating**	Pearson India ,2002		Talk	
		Total	**45**		
Practical	**Complexometric Titration** 1. Ca(II) and Mg(II) in a mixture 2. Hardness of water 3. Fe(III) and Al(III) in a mixture 4. Cu(II) and Zn(II) in a mixture 5. Cu(II) and Ni(II) in a mixture	1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009. 2. Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015	28	Chalk and Talk and Hand on Demonstration	**(SB)**
	Practice		2		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I	**Aromatic Substitution:** **Electrophilic aromatic substitution** Mechanisms and evidences in favour of it including PKIE; orientation and reactivity; reactions:nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbonelectrophiles(reactions: chloromethylation, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); *Ipso* substitution. **Nucleophilic aromatic substitution** Addition-elimination mechanism and evidences in favour of it; SN1 mechanism; *cine* substitution(benzyne mechanism), structure of benzyne. **Birch Reduction of benzenoid aromatics** Benzene, Alkylbenzene, Anisole, Benzoic acid (with mechanism). **General Treatment of Reaction Mechanism –II** **Concept of organic acids and bases** Concept of pKa and pKaH, effect of structure, substituent and solvent on acidityand basicity;proton sponge. **Tautomerism** Basic difference between tautomerism and resonance,prototropy (keto-enol, phenol-keto);composition of the equilibrium in different systems (simple carbonyl; 1,2- and 1,3-dicarbonylsystems, phenols and related systems), factors affecting keto-enol tautomerism,basic ideas aboutvalence tautomerism and ring-chain tautomerism.	1. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020 2. Morrison, R. N. & Boyd, R. N. andBhattacharjee,Organic Chemistry, 7thEdition, Pearson Education, 2010	20	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	**(PR)**

LESSON PLAN: Semester-6 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II	**Stereochemistry –III** **Conformation-I** Basic idea of conformation.ConformationalNomenclature(Newman & Sawhorse):eclipsed,staggered, gauche, syn and anti; Special reference to preferred geometry for β-elimination.Relative stability of conformers on the basis of steric effect: butane-gauche interaction. **Substitution and Elimination Reactions:** **Nucleophilic substitution reactions** Substitution at sp3centre[systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers,epoxides, α-halocarbonyls]: mechanisms (with evidence),relative rates& stereochemical features:SN1, SN2, SN2', SN1' (allylic rearrangement) and SNi; effects of solvent, substrate structure,leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite);substitutions involving NGP (with heteroatoms and phenyl groups). **Elimination reactions** E1, E2, E1cB and Ei (pyrolytic *syn* eliminations); formation of alkenes and alkynes; mechanisms(with evidence), reactivity, regioselectivity (Saytzeff/Hofmann)and stereoselectivity; comparisonbetween substitution and eliminationreactions, comparison between nucleophilicity and basicity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020 4. Morrison, R. N. & Boyd,R. N. and Bhattacharjee, OrganicChemistry,7thEdition,Pearson Education, 2010	13	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	**(PR)**

LESSON PLAN: Semester-6 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III	**Chemistry of alkenes and alkynes** **Addition to C=C** Mechanism (with evidence wherever applicable), reactivity,regioselectivity (Markownikoff andanti-Markownikoff additions) and stereoselectivity; reactions: hydrogenation, halogenation,hydrohalogenation, hydration, oxymercuration-demercuration, hydroboration-oxidation,epoxidation, *syn* and *anti*-hydroxylation, ozonolysis, addition of singlet and triplet carbenes;Simmons-Smith cyclopropanation reaction; electrophilic addition to 1,3-butadiene; conceptofkinetic and thermodynamic control of products; radical addition: HBr addition; mechanism ofallylic and benzylic bromination in competition with brominations across C=C; use of NBS;interconversion of *E* and *Z* alkenes. **Addition to C≡C (in comparison to C=C)** Mechanism, reactivity, regioselectivity(Markownikoff and anti-Markownikoff addition) andstereoselectivity; reactions:hydrogenation, Hg (II) ion catalysed hydration, hydroborationoxidation,dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes byexploring its acidity.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson, 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson, 2003. 3. Nasipuri, D. Stereochemistry of Organic Compounds, 4th Edition, New Age International Pvt Ltd , 2020 4. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7thEdition, Pearson Education, 2010	12	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	**(PR)**
		Total	45		
Practical	**Identification of PureSingle organic Compound.** **Solid compounds** Oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoicacid and salicylic acid **Liquid Compounds**: Formic acid, acetic acid, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehydeand nitrobenzene	1. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical OrganicChemistry,5thEdition, Pearson India, 2003 2. Practical Workbook Chemistry (Honours), UGBOS,	26	Chalk and Talk and Hand on Demonstration	**(PR)**

LESSON PLAN: Semester-6 (Under CCF)

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry-I (CHEM-H-CC4-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	Practice	Chemistry,University of Calcutta, 2015	4		
		Total	30		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : I Stereochemistry – IV	**Conformation-II** Concept of dihedral angle, torsion angle; energy barrier of rotation, concept of torsional and steric strains; relativestability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gaucheinteraction; conformational analysis of ethane, propane, *n*-butane, and 2-methylbutane; 1,2-dihaloalkanes and ethyleneglycol.	Nasipuri, D. Stereochemistry of OrganicCompounds, 4th Edition, New Age International Pvt Ltd, 2020	4	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	
	Concept of prostereoisomerism Prostereogenic centre; concept of (pro)nchirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro-*r* and pro-*s* descriptors of ligands on propseudoasymmetric centre.		4		
	Chirality arising out of stereoaxis Stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, andbiphenyls; related configurational descriptors (*Ra/Sa*); atropisomerism; racemisation of chiral biphenyls		4		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : II Chemistry of carbonyl Compounds	**Nucleophilic Addition to C=O** Structure and reactivity of carbonyl compounds; mechanism (with evidence), reactivity, equilibrium and kineticcontrol; formation of hydrates, cyanohydrins and bisulphite adduct; nucleophilic addition-elimination reactions withalcohols, thiolsand nitrogen-based nucleophiles;reactions: benzoin condensation, Cannizzaro and Tischenkoreactions, reactions with ylides: Wittig and Corey-Chaykovsky reaction; Rupe rearrangement, oxidations andreductions: Clemmensen, Wolff-Kishner, LiAlH4, NaBH4, MPVO redox equilibrium, acyloin condensation;oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education,2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010	10	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials. .	
	Exploitation of acidity of α-H of C=O Formation of enols and enolates; kinetic and thermodynamic enolates; reactions (mechanism withevidence):halogenation of	1. Finar, I. L. Organic Chemistry	10		

LESSON PLAN: Semester-6 (Under CCF) 2026

Department Name: Chemistry

Name of Faculty: Dr Priyabrata Roy (PR)

Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
	carbonyl compounds under acidic and basic conditions, Hell-Volhard-Zelinsky (H. V. Z.)reaction, nitrosation, SeO2 (Riley) oxidation; condensations (mechanism with evidence): Aldol,Tollens',Knoevenagel, Claisen-Schmidt, Claisen ester including Dieckmann; Mannichreaction,Perkin reaction; alkylation ofactive methylene compounds; synthetic applications of diethyl malonate and ethyl acetoacetate; specific enolequivalents (lithium enolates, enamines and silyl enol ethers) in connection with alkylation, acylation and aldol typereaction	(Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education,2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010			
	Nucleophilic addition to α,β-unsaturated carbonyl system General principle and mechanism (with evidence); direct and conjugate addition, addition of enolates (Michaelreaction), Robinson annulations reaction. **Substitution at sp2 carbon (C=O system)** Mechanism (with evidence): BAC2, AAC2, AAC1, AAL1 (inconnection to acid and ester); acid derivatives: amides,anhydrides & acyl halides (formation and hydrolysis including comparison).		8		

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Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Module : III	**Organometallics** Grignard reagents ,Organolithiums; Gilman cuprates: preparation and reactions (mechanism with evidence); additionof Grignard and organolithium to carbonyl compounds; substitution on -COX; directed *ortho* metalation of arenesusing organolithiums, conjugate addition by Gilman cuprates;Corey-House synthesis; abnormal behaviour ofGrignard reagents; comparison of reactivity among Grignard, organolithiums and organocopper reagents;Reformatsky reaction; concept of umpolung.	1. Finar, I. L. Organic Chemistry (Volume 1), 6th Edition , Pearson Education , 2002 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education,2003. 3. Morrison, R. N. & Boyd, R. N. and Bhattacharjee, Organic Chemistry, 7th Edition(Pearson Education), 2010	5	Classroom lectures with chalk and board, PowerPoint presentations, interactive discussions, and distribution of study materials.	
		Total	**45**		

LESSON PLAN: Semester-6 (Under CCF) 2026

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Paper Name & Code: Organic Chemistry – II (CHEM-MD-CC6-5)

Planned				After Implementation	
Unit / Group / Module / Article	**Topics**	**Reference Books**	**No of Lecture Planned**	**Content Delivery Technique**	**Remarks / Comments**
Practical	**Qualitative analysis of single solid organic compound:** 1. Detection of special elements (N, S, Cl) by Lassaigne's test 2. Solubility and classification (solvents: H2O, 5% HCl, 5% NaOH and 5% NaHCO3) 3. Detection of the following functional groups by systematic chemical tests: aromatic amino (Ar-NH2), aromatic nitro (-NO2), amido (-CONH2, including imide), phenolic –OH, carboxylic acid (-COOH), carbonyl (distinctionbetween -CHO and >C=O); only one test for each functional group is to be reported. Each student, during laboratory session, is required to carry out qualitative chemical tests for all the special elements and the functional groups in known and unknown (at least six) organic compounds.	1 .Practical Workbook Chemistry (Honours), UGBOS, Chemistry, University of Calcutta, 2015 2. Furniss, Hannaford, Smith, Tatcholl, Vogel's Textbook of Practical Organic Chemistry ,5th Edition , Pearson India, 2003	28	Chalk and Talk and Hand on Demonstration	
	Practice		2		
		Total	**30**		